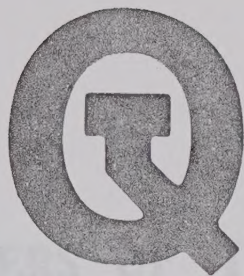


QUALITEC TECH., INC. GC25E

~~BAXTER-NOVACOR~~
METRUM SVCS

COPY



QUALITEC

Technologies, Inc

OPERATION
AND
SERVICE
MANUAL

(This Product is Made in USA)

WARNING:

**USERS OF THIS TESTER SHOULD
READ THIS MANUAL COMPLETELY
BEFORE ATTEMPTING TO
OPERATE.**

**DAMAGE TO THIS EQUIPMENT OR
INJURY AND POSSIBLE DEATH
(FROM ELECTRICAL SHOCK) TO
USER CAN OCCUR IF NOT
OPERATED PROPERLY.**

WARRANT

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QUALITEC

GC25E

AUTOMATIC-DIGITAL

25 TO 30 AMPS

GROUND CONTINUITY TESTER

**OPERATIONS AND SERVICE
MANUAL**

(This product is MADE IN USA)

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MANUAL PART NUMBER: 01-039030

QUALITY

2025

AUTOMATIC BICENTENNIAL

15 TO 20 YEARS

REPAIRS AND SERVICE

OPERATIONS AND SERVICE

MANUAL

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SECTION ONE

GENERAL INFORMATION

1 GENERAL INFORMATION

1-1 SCOPE OF THIS MANUAL

This manual contains the information necessary to operate, calibrate and obtain servicing for the QUALITEC Model GC25E Automatic Digital Ground Continuity Tester.

Technical documentation is included for the user who has access to a metrology organization qualified to perform rudimetry out-of-warranty repairs. QUALITEC factory representatives are available to provide additional assistance if necessary.

1-2 25 TO 30 AMPS GROUND CONTINUITY TESTING APPLICATIONS

There are many applications for 25 TO 30 AMPS Ground Continuity testing. The following are some of the more common:

CSA, VDE, BSI, I.E.C., MIL-SPEC Compliance: All electrical products which are manufactured in compliance with C.S.A., V.D.E., B.S.I., I.E.C. and MIL-SPEC standards must receive a routine (100%) production line 25 TO 30 AMPS Ground Continuity test.

The Ground Continuity test (which consists of applying a high current, usually 25 to 30 AMPS, to the ground circuitry of an electrical product) verifies that the ground conductor of the product being manufactured will withstand abnormal ground current surges commonly occurring during electrical storms, power interruptions, etc. These abnormal current surges commonly exceed ten times the normal line current ratings.

The ground continuity test verifies (in the case of a 3 conductor grounded product) that the ground conductor is securely attached to the product being manufactured and that its electrical resistance is sufficiently low to properly function as the safety "back-up" mechanism to bleed off high currents if the safety insulation of the product should inadvertently fail.

Just as the international line voltages differ from country to country, so do the experienced ground current levels. Consequently, the various regulatory agencies require different levels of test currents. For this reason your QUALITEC Model GC25E has user selectable current control which will satisfy most domestic and international requirements.

Better Quality Control: 25 to 30 AMP Ground Continuity testing is a

universally accepted method for inspecting or testing the quality of electrical products. Ground Continuity testing, in many situations, can detect latent defects in workmanship such as poor ground contacts, poor solder junctions, wrong wire guages, etc. which might not be detectable under normal operating conditions. QUALITEC Testers are accurate and consistent for detecting these and similar types of defects.

Product Liability Protection: In today's environments, users of your products demand safe reliable products. To minimize skyrocketing liability insurance premiums your products must be safe and reliable. Ground Continuity testing is a chosen method for verifying to your insurance carrier that your products are safe to use and insurable. QUALITEC Testers can provide the testing information you need for your product liability insurance carrier.

1-3 STANDARD TESTING FEATURES

The QUALITEC Model GC25E incorporates a unique, advanced design technology which offers economical user convenience and flexibility.

The Model GC25E has the only truly TOTAL SOLID STATE CONTROL technology on the market.

The test cycle is TOTALLY AUTOMATIC. This insures the user that consistent and accurate tests are performed regardless who (high or low skilled) performs the tests or when they are performed.

The Model GC25E has a SUPER FAST SHUTDOWN SPEED (less than 5 milliseconds). This super fast feature permits safe and sensitive non-destructive testing for product failures. Your concern for the best sensitivity in detecting faulty products can be satisfied with the Model GC25E.

Every Model GC25E is equipped with DIGITAL PANEL METERS for precise monitoring of both current and resistance.

The SEPARATE AUDIBLE and VISUAL FAILURE ALARMS for *ground continuity resistance* permit the user to easily and quickly determine that a failure occurred on the product being tested.

The visual IN TEST indicators clearly let the user know the status of each test whether it be "*in progress*" or "*completed*".

The SWITCH SELECTABLE and CONTINUOUSLY ADJUSTABLE GROUND RESISTANCE MONITOR LEVELS allow the user flexibility in testing many different products with different ground resistances to satisfy most

international requirements.

The SWITCH SELECTABLE and CONTINUOUSLY ADJUSTABLE TEST DWELL TIMES allow the user flexibility in testing like products or different products to most international regulatory agency requirements.

The LIGHTWEIGHT, COMPACT styling with handles allows the Model GC25E to be carried and used practically anywhere. Every Model GC25E operates on both 115VAC, 60Hz and 240VAC, 50Hz INPUT LINE VOLTAGES. This feature allows the Model GC25E to be used essentially anywhere in the world, providing you additional flexibility.

1-4 STANDARD SAFETY FEATURES

The SUPERFAST SHUTDOWN (less than 5 milliseconds) greatly minimize any high current exposure to the user in case of a product failure during a test. This speed is also fast enough to avoid destruction to the product under test in most situations.

The TOTAL AUTOMATIC TEST CYCLE allows a user to stand clear of any work station or product under test during the test cycle.

Every QUALITEC Tester receives rigorous factory testing including Hipot, leakage current and ground continuity tests before shipment. This procedure insures you of the highest quality tester.

1-5 OPTIONS

The Model GC25E has several convenient options.

REMOTE CONTROL is available with TTL/CMOS compatibility (Option# 30) and DRY CONTACT RELAYS (Option# Q40), which provide you with the easiest standard factory automation integration.

The EXTENSION CORD START/RESET HAND and FOOT CONTROLS (Options# Q50H and Q50F) offer other alternatives to controlling a test cycle from a distance.

The EXTENDED WARRANTY/SERVICE POLICY (Option# Q120) provides for an additional ONE (1) year of free labor and material repairs beyond the

SECTION 1

GENERAL INFORMATION

normal one (1) year warranty period as outlined in the policy.

The 19 INCH RACK MOUNT (Option #Q130) allows a user to install the GC25E into standard 19 inch rack cabinets.

SECTION TWO

PHYSICAL DESCRIPTION

2. PHYSICAL DESCRIPTION

2-1 INTRODUCTION

The Model GC25E was designed to provide repeatable, efficient and accurate operation with minimal training. To assist the first-time user of the Model GC25E to become familiar with its operation, Sections 2-2, 2-3 and 2-4 describe in detail each control and user feature. Section 8 includes instructions for optional features.

2-2 FRONT PANEL-OPERATION AND CONTROLS

The Front Panel contains the operator controls, test status indicators and output for the test current and measured resistance as described in the following paragraphs and illustrated in Fig. 2-1.

1.- **POWER** switch is a rocker switch which applies AC line input power to the tester when depressed in the position of the international ON symbol " I ". The presence of line power is also indicated by the illuminated amber light in the switch rocker.

AC line power is switched off when the rocker is depressed in the position of the international OFF symbol " O ". The amber light in the switch rocker will extinguish when the rocker is in the off position.

2.- **START** switch is a white button momentary switch which initiates the test cycle when depressed.

This switch needs to be depressed only momentarily and the complete test cycle will automatically proceed. Additional depressing of this switch during the test cycle will have no effect on the performance of the test which is in progress. Once the test cycle commences, the tester control electronics locks out the start signal from this switch.

If the tester detects a failure condition in the device under test, this switch can not initiate another test cycle until the RESET switch (RED) button is depressed to clear the alarms.

3.- **RESET** switch is a red button momentary switch which may be used for two purposes.

One purpose is to clear the audible and visual failure alarms and reset the tester's control electronics for another test cycle.

The second purpose is to abort a test cycle which is in progress. After the test cycle is aborted, the tester's control electronics will be

automatically reset for another test cycle.

4.- **CURRENT ADJUST** is a recessed slotted shaft which adjusts the magnitude of the output test current for a given typical load.

Any small bladed screwdriver may be inserted into the shaft slot to adjust the test current up to 30A (for a maximum load resistance of 0.16 ohms). Clockwise adjustment increases the output current. Counterclockwise adjustment decreases the output current.

The tester's control electronics will automatically ramp-up and for a given typical load, consistently generate the current which is preadjusted by this setting for every test cycle until changed by this method. The digital AMPS meter will display the actual output current after the START button is depressed.

5.- **CURRENT OUTPUT** is the output receptacle for the high current ground sensing circuitry.

The three foot cable assembly with a banana plug on one end and an alligator clip on the other should be connected into this receptacle during a test cycle; and the alligator clip end is clamped to the chassis or a grounded exposed metal portion of the device under test. During a test cycle this circuitry will sense the actual amount of ground-loop resistance of the device under test; compare the actual resistance with a preselected acceptance level; illuminate the R-FAIL LED indicator if unacceptable (the audible alarm also will be activated if resistance is found unacceptable during a test cycle).

Note: The power cord of the device under test (DUT) must be plugged into the DUT TEST RECEPTACLE before the Ground Continuity test can be performed properly.

If the Safety Ground resistance becomes unacceptable during the Ground Continuity test cycle, the RESET must be depressed to reset the audible alarm and the R-FAIL LED, before another test cycle can be started. User selection procedures for presetting the acceptable safety ground resistance threshold are described in SECTION 6 of this manual.

WARNING: The chassis of the device under test must not be in contact with earth or facility ground because erroneous Safety Ground Sense results could occur and a hazardous condition could result to the operator because continuous high current could flow to ground through the DUT. IF YOU HAVE ANY DOUBT

OR QUESTION, CONTACT A QUALITEC FACTORY REPRESENTATIVE AT (415) 498-1046, (415) 498-1047 OR FAX (415) 498-5938.

6.- **DUT TEST RECEPTACLE** is a three conductor (HOT, NEUTRAL and Ground) receptacle which is specially designed to safely carry currents up to 40A.

During the ground continuity test cycle, HOT and NEUTRAL are left floating internally to comply with regulatory requirements and the proper test technique.

The Ground conductor is used as the High Current RETURN for detecting excessive resistance failure conditions in the device under test.

WARNING: This receptacle is specially designed and manufactured for Ground Continuity test applications. If replacement is ever required, it must be replaced with only a genuine QUALITEC replacement. Non-QUALITEC look-alike replacements may not be safe or adequate for high current applications.

The power cord of three wire grounded devices which are to be tested must be plugged into this receptacle before initiating the ground continuity test cycle.

7.- **OHMS** is a digital ohmmeter which displays the actual output resistance applied at the DUT TEST RECEPTACLE during a ground continuity test cycle.

This meter is a three and one-half digit display which is capable of displaying resistances in increments of 0.001 ohms.

8.- **AMPS** is a digital ammeter which displays the actual amount of high current which is present in the device under test during the Ground Continuity test.

This meter is a three and one-half digit display which is capable of displaying current in increments of 0.1 A (100 milliamps).

9.- **TEST** is an amber LED and when illuminated indicates that a ground continuity test cycle is in progress and high current is present at the CURRENT OUTPUT RECEPTACLE.

Momentary depressing of the RESET button will abort the test cycle, extinguish this LED, and reset the control electronics for another test cycle.

WARNING: The chassis of the device under test must not be in contact with earth or facility ground because erroneous Safety Ground Sense results could occur and a hazardous condition could result to the operator because continuous high current could flow to ground through the DUT. IF YOU HAVE ANY DOUBT OR QUESTION, CONTACT A QUALITEC FACTORY REPRESENTATIVE AT (415) 498-1046, (415) 498-1047 OR FAX (415) 498-5938.

10.- **R-FAIL** is a red LED and when illuminated indicates that the ground resistance (for the preadjusted high current) in the device under test exceeds the resistance monitor levels (trip threshold) preselected by the R-TRIP slide switch (position 1 or 2). See SECTION 6 for technical details on readjusting the preselected resistance trip threshold assigned to R-TRIP switch positions 1 and 2.

When this LED is illuminated, the audible alarm will be simultaneously activated. Momentary depressing of the RESET button will extinguish this LED and reset the control electronics for another test cycle.

11.- **R-LOW** is a red LED and when illuminated indicates that the device under test required an excessive amount of current (greater than 40A). This can only be the result of a ground resistance which deviates more than 0.1 ohms from the ground resistance monitor level.

When this LED is illuminated, the audible alarm will be simultaneously activated. Momentary depressing of the RESET button will extinguish this LED and reset the control electronics for another test cycle.

12.- **R-TRIP** is a slide switch which selects one of two preselected resistance trip thresholds for monitoring unacceptable levels of ground resistance in the device under test. The trip thresholds initially assigned to the switch by QUALITEC are: Position 1 - 0.1ohms, Position 2 - 0.12ohms; both for a preadjusted current of 25A.

See SECTION 6 of this manual for technical details on readjusting the preselected resistance threshold assigned to positions 1 and 2 of this switch. This switch is recessed so as to prevent inadvertent changes in the switch position. Any small bladed screwdriver may be used to slide the switch lever to either position.

13.- **TIME** is a slide switch which selects one of two preselected Ground Continuity test times.

The test time is the actual time of applying high current to the device under test. The times normally assigned to this switch by QUALITEC are

1 = 5 sec

2 = 10 sec

(Position 1 = 5 second, Position 2 = 10 seconds). See SECTION 6 of this manual for technical details on readjusting the preselected time values assigned to positions 1 and 2.

14.- **AUDIBLE ALARM** is the unlabelled hole located to the right of the TEST LED.

It is activated simultaneously with the appropriate LED for all failure conditions which occur during a Ground Continuity test of a device under test. The audible alarm is a high-pitched continuous buzzer. It is audible for excessive safety ground resistance and excessive output current.

Momentary depressing of the RESET button will deactivate the audible alarm and reset the control electronics for another test cycle.

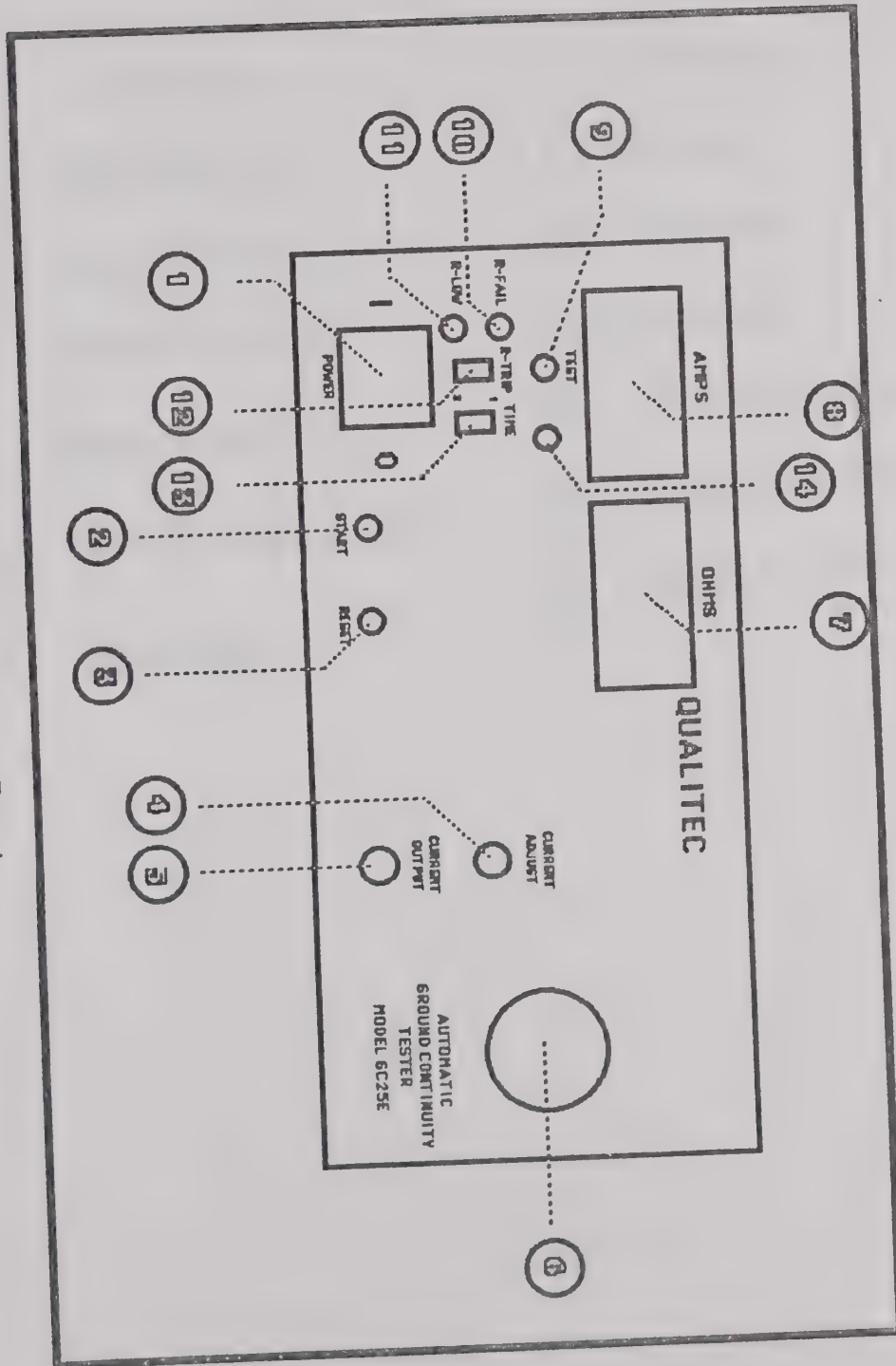


Fig. 2-1. Front Panel



① POWER SWITCH

② START SWITCH

③ RESET SWITCH

④ CURRENT ADJUST

⑤ CURRENT OUTPUT

⑥ OUT TEST RECEPTACLE

⑦ OZONE METER

⑧ AMPS METER

⑨ TEST LED

⑩ R-FAIL LED

⑪ R-LOW LED

⑫ R-TRIP SWITCH SELECTOR

⑬ TIME SWITCH SELECTOR

⑭ AUDIBLE ALARM

2-3 REAR PANEL-OPERATION AND CONTROLS

The Rear Panel contains the input line voltage selector, input power cord receptacle, power input fuse, Ground Test Point (TP-1) and the optional remote control receptacle as described in the following paragraphs and illustrated in Fig. 2-2.

1.- **POWER INPUT** is the receptacle for the Ground Continuity tester detachable AC line-in power cord.

2.- **LINE VOLTAGE SELECT** is a slide switch which configures the Ground Continuity tester for either 115 VAC or 240 VAC input line voltage operation.

CAUTION: Be sure to select the proper line voltage before plugging the power cord into the line voltage source. Damage to the Ground Continuity tester can occur if selector switch setting does not match line source voltage amplitude.

3.- **REMOTE INTERFACE (REM)** is an optional receptacle for Remote Control Options Q30, Q40 and the Extension Cord Start/Reset Control Options Q50H and Q50F.

4.- **FUSE (F1)** is the power input fuse and is part of the circuit protection. It is rated at 5A for 120VAC and 2.5A for 240VAC.

WARNING: Never install fuses with higher ratings than these values. Damage to the tester or operator injury could occur.

5.- **TP-1 GROUND** is a receptacle only for providing a low current ground reference.

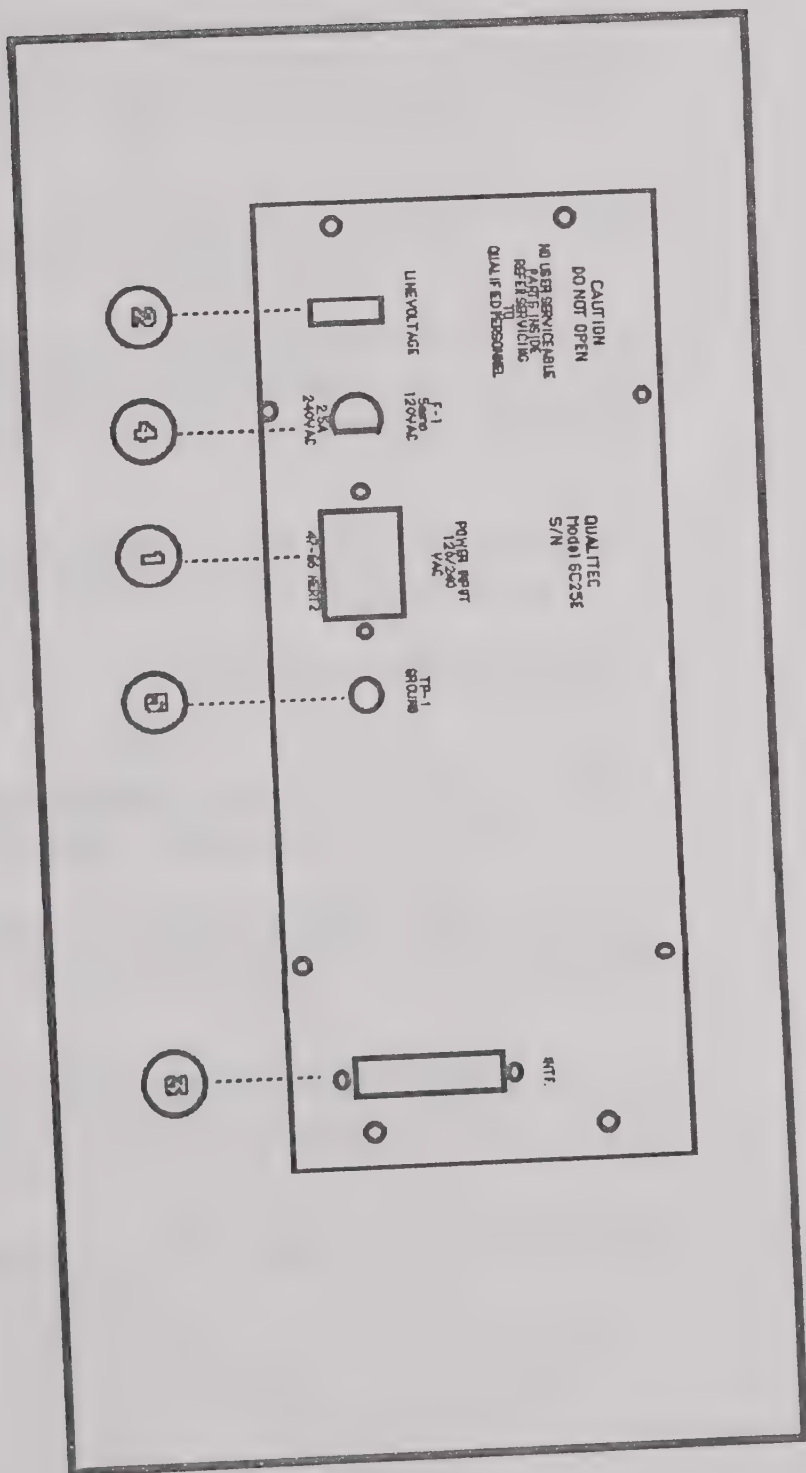


Fig. 2-2 Rear Panel

- 1 POWER INPUT RECEPTACLE
- 2 LINE VOLTAGE SELECTOR SWITCH
- 3 REMOTE INTERFACE CONNECTOR (RIFC)

- 4 FUSE (F1)
- 5 TP-1 GROUND

2-4 INTERIOR LAYOUT

Inside the Model GC25E there are three printed circuits boards, the high current and power supply transformers, the variac, the solid state relay and a strip barrier connector as described in the following paragraphs and illustrated in Fig. 2-3.

1.- **CONTROL BOARD** is a P.C.B. which contains all of the power supply, control and monitoring electronics for the Model GC25E.

2.- **FRONT PANEL BOARD** is a P.C.B. mounted against the Front Panel of the instrument and contains the resistance measurement circuit and all the operator controls and indicators which are accessible from outside the front.

3.- **POWER SUPPLY TRANSFORMER** provides the AC voltage required by the Control P.C.B. to generate the different electronic bias voltages.

4.- **STRIP BARRIER** is the connector where all the electrical assemblies are interconnected.

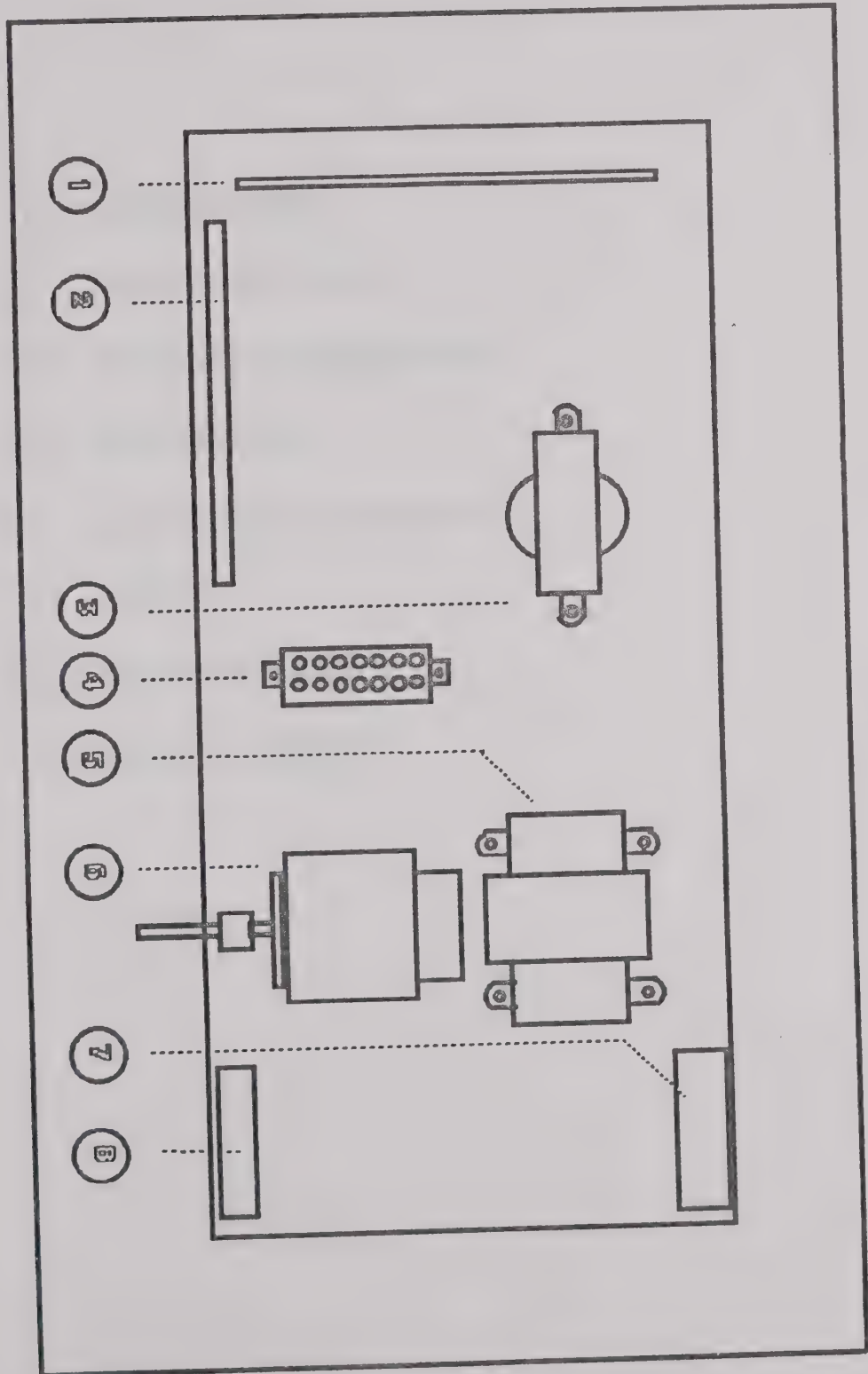
5.- **HIGH CURRENT TRANSFORMER** provides the output high current in an amount proportional to the input voltage given by the variac.

6.- **VARIAC** is the autotransformer which provides a variable amount of input voltage to the high current transformer from the power input voltage.

7.- **SOLID STATE RELAY** is a power control device which turns on and off the power input voltage supplied to the variac input, hence controlling the generation of the high current.

8.- **MONITORING BOARD** is a P.C.B. which provides low voltage monitoring signals to the Control P.C.B.

Fig. 2-3. Interior LAYOUT



- ① CONTROL BOARD
- ② FRONT PANEL BOARD
- ③ POWER SUPPLY TRANSFORMER
- ④ STRIP BARRIER
- ⑤ HIGH CURRENT TRANSFORMER
- ⑥ VARIAC
- ⑦ SOLID STATE RELAY
- ⑧ MONITORING BOARD

SECTION THREE

PRINCIPLES OF OPERATION

3. PRINCIPLES OF OPERATION

3-1 INTRODUCTION

Section 3 describes the initial installation set-up and turn-on procedures, a brief system functional overview, the Principles of Operation of the High Current Interface, General Control Electronics, and Operator Instructions.

The contents of Sections 3-1 through 3-3 are intended for qualified service or metrology personnel; whereas, Section 3-4 is for operators.

The installation and set-up procedure described in paragraph 3-2 is important in verifying the proper operation of this equipment and should be performed by only a qualified service or metrology person.

This product was manufactured with the highest standards in material and workmanship and received rigorous quality testing procedures before shipping. However, users or service and metrology personnel are encouraged to contact a QUALITEC factory representative if any question arises regarding the operation or performance of this equipment. QUALITEC factory service representatives may be reached at

(415) 498-1046, (415) 498-1047 OR FAX (415) 498-5938

3-2 INSTALLATION

The following sequence of procedures are necessary for proper set-up and initial turn-on of the Model GC25E Automatic Digital Ground Continuity Tester.

1- Slide the **LINE VOLTAGE SELECT** switch to the desired operational power input voltage (115VAC or 240VAC).

2- Set the **AC POWER** switch on the front panel to the OFF (" 0 ") position. Insert the female plug of the AC power cord into the **POWER INPUT** receptacle on the rear panel.

3- Connect the male plug of the AC power cord into an AC power source which matches the voltage amplitude of the **LINE VOLTAGE SELECT** switch selected in step 1 above.

4- Set the **POWER** switch to the ON ("I") position. The amber light on the **POWER** switch will illuminate. The digital **OHMS** and **AMPS** meters on the front panel will read zero.

5- Plug the banana end of the high current Ground Sense cable into the front panel **CURRENT OUTPUT** receptacle and connect the alligator clip end of the same cable to the chassis or exposed metal part of the DUT. Connect the power cord of the DUT into the **DUT Test Receptacle**.

6- Using a screwdriver, turn the **CURRENT ADJUST** Control on the front panel in the clockwise direction approximately half of a turn from the full counterclockwise position.

NOTE: SPECIAL CARE MUST BE TAKEN IN EXECUTING THE FOLLOWING STEPS. HIGH CURRENT IS GENERATED AND PRESENT AT THE HIGH CURRENT OUTPUT DURING THE TEST CYCLE; IF YOU ARE UNSURE, HAVE ANY QUESTIONS OR NEED ASSISTANCE, CONTACT A QUALITEC FACTORY SERVICE REPRESENTATIVE AT (415) 498-1046, (415) 498-1047 OR FAX (415) 498-5938.

7- Using a small bladed screwdriver, slide the **TIME** switch on the front panel to position "1" if it is not currently in this position.

8- Depress the **START** switch on the front panel momentarily.

The **TEST LED** will illuminate and the digital **AMPS** meter will ramp up to less than 25A. After 5 sec the **TEST LED** will extinguish and the reading on the digital **AMPS** meter will return to zero.

9- Set the **TIME** switch on the front panel to position "2".

Repeat step 8. The **TEST LED** will illuminate this time for 10 sec.

10- Repeat step 9 and while the **TEST LED** is on, depress the **RESET** switch on the front panel momentarily. The test cycle will be aborted, the **TEST LED** will extinguish immediately and the reading on the digital **AMPS** meter will return to zero.

11- Repeat step 9 and while the **TEST LED** is on, disconnect the banana side of the high current Ground Sense cable from the front panel. The test cycle will be aborted as in step 10. The **R-FAIL** red LED will illuminate and the audible alarm will produce a continuous high pitch tone. Depress

the RESET switch on the front panel momentarily and the alarm will be extinguished.

3-3 FUNCTIONAL DESCRIPTION

The main functions of the Model GC25E Automatic Digital Ground Continuity Tester are described below:

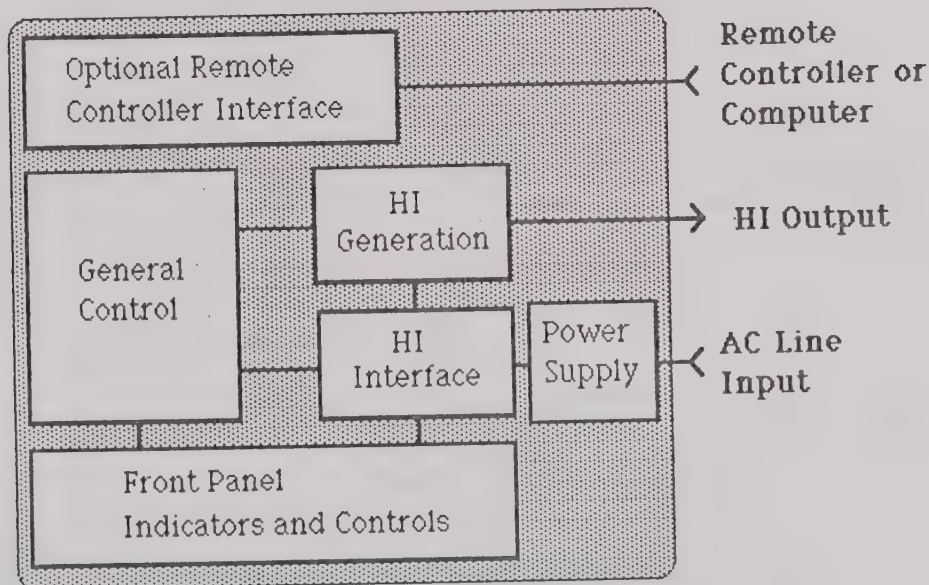


FIG. 3-3 Model GC25E Functional Diagram

The **HI(High Current) Generation** is produced under the control of the **General Control**.

The **HI Interface** provides monitoring of the **HI Output** parameters to the **Front Panel Indicators**. It also provides failure signals to the **General Control**.

The **General Control** accepts failure information from the **HI Interface** and control information from the **Front Panel Controls**. Using the information, it coordinates the cycle of operations during the test.

A **Remote Controller or Computer** could be connected to control and monitor the main functions of the Ground Continuity Tester. Communications interface standards which are available include: Standard

TTL or Dry Contacts interfaces.

3-3.1 HIGH CURRENT INTERFACE

The High Current Interface monitors the basic analog signals and provides Excessive Current detection as shown below.

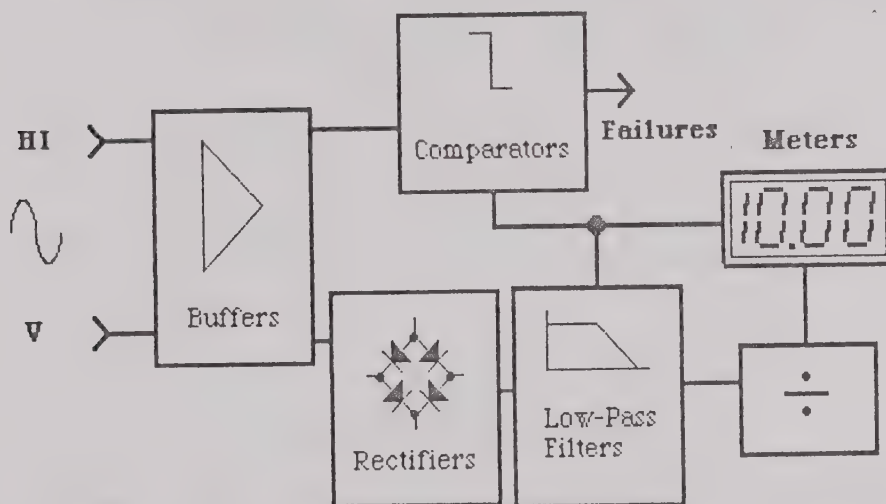


Fig. 3-3.1 High Current Interface

The two basic analog signals: High Current and Output Voltage are buffered, rectified and filtered. The Front Panel Meters receive and display the High Current and measured Resistance signals. The Comparators are monitoring both, overcurrent (excessive current) failure conditions on the High Current signal and Safety Ground excessive resistance failure conditions on the Output Voltage signal. The failures are transmitted to the General Control portion of the Ground Continuity Tester for processing.

3-3.2 GENERAL CONTROL

The General Control is the "local brain" of the Ground Continuity Tester as shown below:

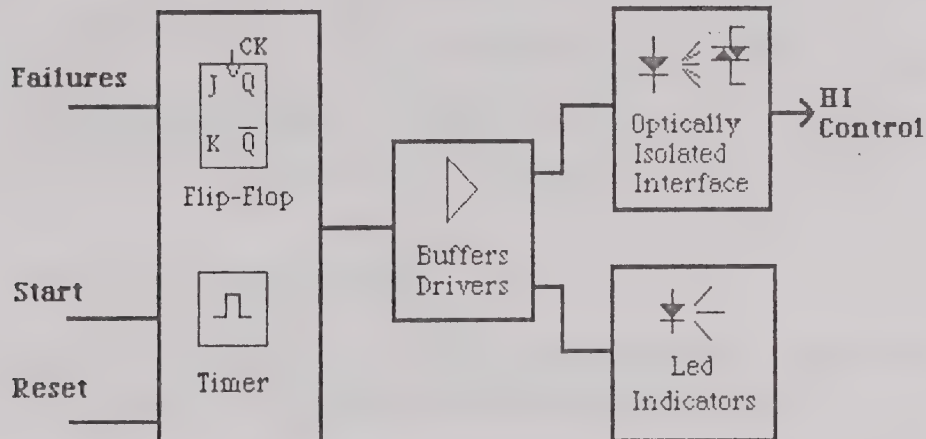


Fig. 3-3.2 General Control

The solid state timing circuitry (TIMER) can be started and reset by the operator. It provides the test cycle duration.

The Flip-Flops latch the different failure signals provided by the High Current Interface and automatically resets the Timer. Further start signals to the Timer are inhibited until the latched failure condition is cleared with the reset signal. The failure conditions as well as the Timer status are visually and audibly monitored on the Front Panel Indicators via the Drivers.

The Timer also drives the Optically Isolated Interface which controls the High Current generation during the test cycle.

3-4 OPERATOR INSTRUCTIONS

3-4.1 INTRODUCTION

The Model GC25E Automatic Digital Ground Continuity Tester was designed to perform accurate, repeatable and efficient Ground Continuity tests with minimal operator training. However, the procedures in SECTION 3-1 through 3-3 of this manual should be performed by a qualified service or metrology technician before performing the instructions in this operator section. Also, the operator must be familiar with the operator controls as described in SECTION 2 of this manual before performing actual tests on any device.

3-4.2 OPERATION PROCEDURES

Since the Model GC25E is an automatic tester, its operation is simple and efficient. The following steps describe the operating procedure:

CAUTION: Additional operating instructions for Options are located in Section 8 of this manual. Be sure to read the remainder of this manual including Section 8 before attempting to operate.

WARNING: The chassis of the device under test must not be in contact with earth or facility ground because erroneous high current Ground Sense results could occur and a hazardous condition could result to the operator because continuous high current could flow to ground through the DUT. IF YOU HAVE ANY DOUBT OR QUESTION, CONTACT A QUALITEC FACTORY REPRESENTATIVE AT (408) 984-1763 OR (415) 325-2878.

- 1- Verify that the **POWER** switch of the tester is in OFF ("0") position.
- 2- Plug the power cord into the rear panel receptacle then into an appropriate power source outlet (115 VAC, 60 Hz or 240 VAC, 50 Hz) as configured by the rear panel **LINE VOLTAGE SELECT** switch.
- 3- Switch the front panel **POWER** switch to the ON ("1") position. Note that the power switch light illuminates verifying that the instrument is powered on.

4- Plug the device to be tested (or the test fixture cable assembly) into the front panel **DUT TEST RECEPTACLE**.

5- Connect the **CURRENT OUTPUT** cable between the front panel of the tester and the chassis ground of the device to be tested or to the test fixture of the device under test.

6- Press the **RESET** switch on the front panel.

7- Press the **START** switch.

WARNING: AT THIS STEP HIGH CURRENT IS PRESENT AT THE TESTER CURRENT OUTPUT RECEPTACLE, CURRENT OUTPUT CABLE ASSEMBLY TO THE DEVICE UNDER TEST, THE TEST FIXTURE (IF USED), AND THE DEVICE UNDER TEST.

DO NOT TOUCH THE CURRENT OUTPUT CABLE, TEST FIXTURE OR THE DEVICE UNDER TEST DURING THE TEST CYCLE.

8- The test cycle will progress automatically without any further operator intervention. The **TEST** light on the tester front panel verifies that a test is in progress and the digital panel meters display test result values. If the device under test passes, the **TEST** light will extinguish at the end of the test cycle without any failure alarms. At the end of the test cycle, the device under test may be removed and the next device to be tested may be connected.

9- If the device under test fails any test parameter the appropriate failure LED and audible alarms will signal a failure and the test will be aborted immediately.

10- If a **R-FAIL** failure occurs, check to be sure that the **TEST** LED is extinguished and that no output current is displayed on the panel meter. Then remove the device under test and install the next device before resetting the tester.

11- If a **R-LOW** failure occurs (output current exceeded 40A) remove the device under test and check the 25A calibration again as described in Section 6.

12- Press the **RESET** switch on the tester front panel to reset the tester electronics and extinguish all failure alarms.

13- The next test cycle may be performed now by repeating the previous steps 4 through 11 of this section.

SECTION FOUR

TECHNICAL DESCRIPTION

4 TECHNICAL DESCRIPTION

4-1 GENERAL DESCRIPTION

The Model GC25E Automatic Digital Ground Continuity Tester main functions are implemented as shown in the Block Diagram of Fig. 4-1.

Three standard printed circuit board assemblies are used: the Control Board, the Front Panel Board and the HI Board.

The remote control communication can be accomplished with the optional Remote Controller Interface Board.

The HI Transformer and Variac sections of the H.I. generation function are directly controlled by the Control Board.

4-2 MODULES DESCRIPTION

4-2.1 CONTROL BOARD

The following description refers to Drawings *32-022041-1, 2 and 3 which are located in Section 7 of this manual.

The **POWER SUPPLY** portion of the **CONTROL BOARD** electronics takes the **30VAC** and **8VAC** from the Power Supply Transformer and generates **+15V**, **-15V** and **+5V**.

The circuitry consists of full wave rectifiers, filters and series voltage regulators as shown in Drawing *32-022041-2. Transzorb **CR18** further regulates against transients.

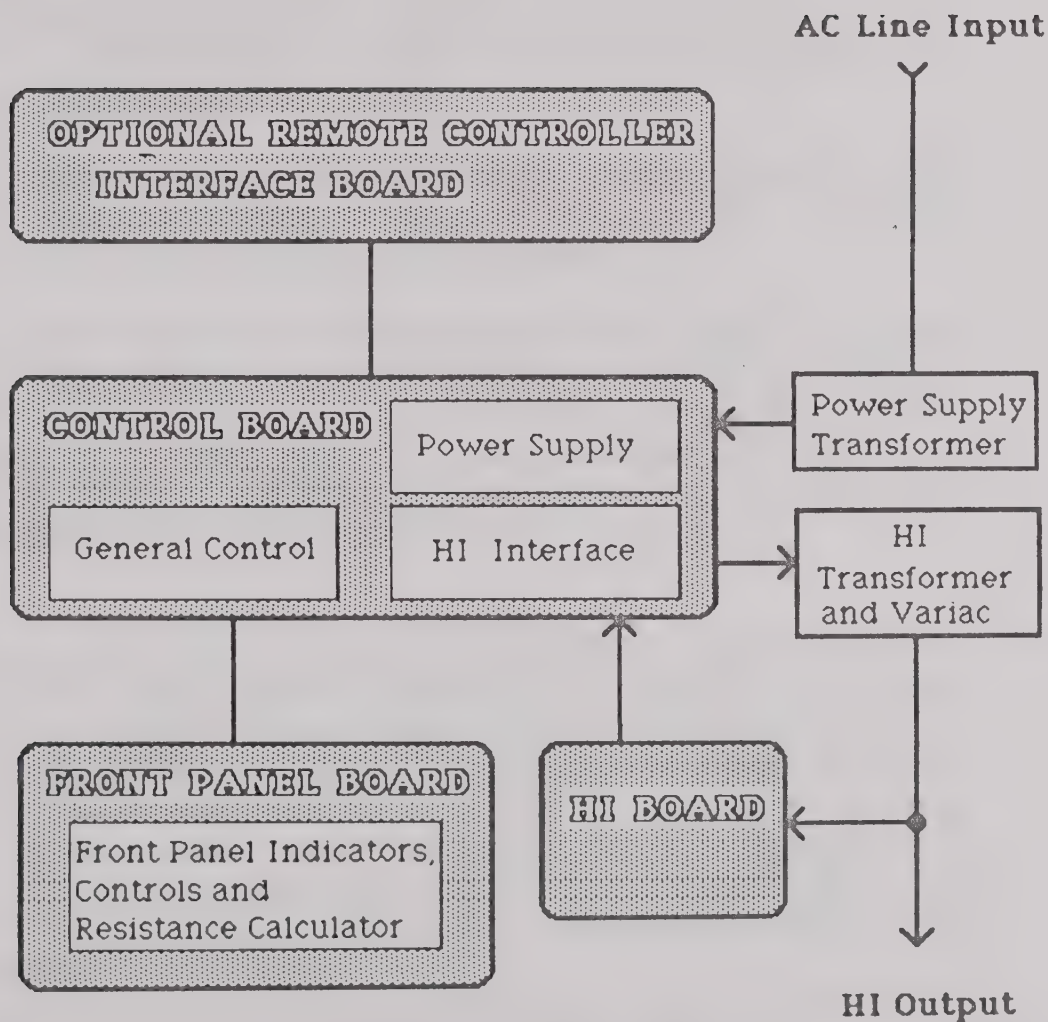


Fig. 4-1 GC25E Electronic Assembly Functional Block Diagram

As shown in Drawing #32-022041-1 and 2, the **HI INTERFACE** portion of the **CONTROL BOARD** electronics receives the attenuated Voltage output **V SENSE** and the Output Current **I SENSE** from the **HI Board**. The Quad Op Amp J FET Input **U6** buffers these signal and the Quad Op Amp **U1** half-way rectifies and filters them, generating equivalent DC voltages. Potentiometers **R4** and **R5** are used to calibrate the magnitude of the **VOLTS** and **AMMETER** signals respectively and potentiometers **R6** and **R7** are used to calibrate their zeroing.

Dual Comparator **U7** detects instantaneous excessive values of output current, which corresponds to excessive output resistance drop and converts them into a low active digital signal **OVER-I**.

One Comparator in **U2** detects the **R** signals which exceed a preset value **RTRIP** and generates a low active digital signal **OVER-R**. This **R** signal is monitoring the Safety Ground Resistance. The signal **RTRIP** is switch selectable on the Front Panel of the Model GC25E. The front panel selections **RTRIP "1"** and **RTRIP "2"** are adjustable for preselection by potentiometers **R14** and **R15**, respectively.

As shown in Drawing # 32-022041-3, the **GENERAL CONTROL** portion of the **CONTROL BOARD** electronics provides time control for the test cycle, buffering for control inputs and driving for external status indication.

The falling transition of the **START** signal is converted into a low active pulse by **U5**, which activates the timer **U10**. The duration of the timer output corresponds with the test time duration and is switch selectable on the Front Panel of the Model GC25E. The front panel switch **TIME "1"** and **TIME "2"** are adjustable for preselection by potentiometers **R13** and **R12**, respectively.

The timer output is connected to the driver **U4** to supply the **TEST** signal. This signal drives the input of the solid state relay which switches on the **AC LINE INPUT** to the High Current Transformer. This then generates the High Current Output.

The **TEST** signal is also passed to the Front Panel Board for LED indication of a test-in-progress status.

The J-K Flip-Flops **U3** and **U8** latch the failure signals given by the **HI Interface** portion of the **CONTROL BOARD** electronics when a test is in progress. These signals are then passed to driver **U4** to supply Front Panel LED indication. The latched **OVER-I** signal is indicated as **R-LOW** on the Front Panel. The latched **OVER-R** signal is indicated as **R-FAIL**.

If any of the failure signals are produced during a test, it latches the Fail Flip-Flop in U3 while driver U4 provides the corresponding FAIL signal indication. The output of the Fail Flip-Flop in U3 also resets the timer U10. The NOR gates in U9 group the reset signals for the timer including the RESET signal coming from the Front Panel. The NOR gates also clear all the Flip-Flops.

4-2.2 HIGH CURRENT BOARD

As shown in Drawing# 32-022009 the High Current Board provides (with scaled low voltage) signals for monitoring the High Current Output (ISENSE) and Output Voltage (VSENSE).

R1 and R2 attenuates the Voltage at the HI Transformer Output from 10VAC RMS down to 10VAC peak.

R3 is in series with the Output loop and generates a 50mVAC RMS drop voltage when the Output Current is 25A RMS.

4-2.3 FRONT PANEL BOARD

As shown in Drawing# 32-022047 this Board contains all of the Front Panel Indicators and Controls for the Control Board to which it connects through a 26 pin header connector P1.

The momentary S3 (START) and S4 (RESET) switches provide a closed condition to ground to the Control Board when depressed. These switches are normally in the open condition.

The slide switch S2 provides selection between two timing potentiometers TIME "1" and TIME "2" on the Control Board for the solid state timing circuitry through the TIME output.

The slide switch S1 provides selection between two voltage references RTRIP "1" and RTRIP "2" on the Control Board for the Excessive Resistance comparator through the RTRIP output.

The LEDs CR2, CR4 and CR3 provide indication for the TEST, R-LOW and R-FAIL status signals. RP1 provides current limitation.

The Buzzer DS1 provides audible indication for the FAIL status signal.

R2 provides current limitation.

The pin headers P2 and P3 provide output bias and signals to the digital Meters on the Front Panel. The input signals for the digital Meters are provided with an analog ground reference SIGNAL- .

The AMMETER signal is provided to the AMPS Digital Meter. This signal and the VOLTS signal are previously buffered by U5 before being used for calculating the Load Resistance with the precision divider U3, which provides the proper output signal to the OHMS Digital Meter.

SECTION FIVE

SPECIFICATIONS

5. SPECIFICATIONS

The following is a list of specifications and characteristics of the Model GC25E.

OUTPUT CURRENT RANGE:	UP TO 30 A - USER SELECTABLE
NO LOAD VOLTAGE:	UP TO 10 VAC - USER SELECTABLE RANGE
GROUND RESISTANCE RANGE:	UP TO 0.16 OHMS - USER SELECTABLE
RESOLUTION:	0.25% FULL RANGE (0.1 AMPS) 0.6% FULL RANGE (0.001 OHMS)
ACCURACY:	1% FULL RANGE
TEST TIME RANGE:	0.1 sec TO 18 sec - USER SELECTABLE
SHUTDOWN SPEED:	LESS THAN 5 MILLISECONDS
INPUT POWER:	115/240 VAC, 50/60Hz - USER SWITCH SELECTABLE
DIMENSIONS:	6" H, 17 1/2" W, 13 1/2" D (15.2 cm, 41.0 cm, 34.3 cm)
WEIGHT:	30 lbs. (13.5 Kg) NET 38 lbs (17.1 Kg) SHIPPING
STORAGE:	
TEMPERATURE:	10°C TO 60°C
HUMIDITY:	LESS THAN 95% NON-CONDENSING

SECTION SIX

MAINTENANCE AND SERVICE

6. MAINTENANCE AND SERVICE

6-1 INTRODUCTION

QUALITEC has designed products and optional accessories so as to require minimal calibration or adjustments. This design philosophy ensures that these products perform to the highest and most accurate standards which you require.

Several user selectable features, however, have been designed into this product to provide flexibility and convenience in its applications. Section 6 describes the calibration procedures for these features, product warranty and instructions for returning equipment for repair if necessary.

WARNING: Paragraphs 6-2.1, 6-2.2, 6-2.3, 6-2.4 and 6-2.5 involve some exposure to high currents. The procedures in these paragraphs must be performed by only a qualified service or metrology person. If you are unsure or have any questions contact a QUALITEC factory service representative at (415) 498-1046, (415) 498-1047 OR FAX (415) 498-5938.

QUALITEC also offers periodic calibration or adjustment service for a nominal charge.

The optional calibration accessories which QUALITEC offers simplifies the calibration and adjustment procedures with maximum safety. QUALITEC encourages the use of these optional accessories whenever performing these procedures. Contact QUALITEC at (415) 498-1046, (415) 498-1047 or FAX (415) 498-5938 to order any of these calibration accessories.

6-2 CALIBRATION PROCEDURE

The user selectable parameters for the Model GC25E are set at the factory for shipment as follows:

Output Current: 25A at 0.1 ohms

Test Time "1": 5 sec

Test Time "2": 10 sec

R-Trip "1": 0.1 ohms at 25A

R-Trip "2": 0.12 ohms at 25A

The following description explains how to change these factory set parameters.

WARNING:

The service or metrology person must have read and performed the **INSTALLATION** procedure described in Section 3-2 before attempting these calibration procedures. Also, only qualified and authorized technical personnel should attempt to perform this calibration procedure. Avoid contact with any internal or external parts. If you are unsure, have any questions or need assistance, contact a QUALITEC factory service representative at (415) 498-1046, (415) 498-1047 or FAX (415) 498-5938.

6-2.1 CURRENT ADJUSTMENT

Select the R-Trip "2" Switch position. With a typical load connected to the front panel **DUT Test Receptacle** of the Model GC25E and the High Current Output Ground Sense cable connected to the chassis or any exposed metal part of the DUT, depress the Start button. Adjust the **Current Adjust** on the front panel until the desired output current is obtained. Repeat this procedure as needed.

6-2.2 TEST TIME ADJUSTMENT

The Test Time "1" and "2" are adjusted by using the potentiometers **R13** and **R12** on the Control P.C.B. (Schematic * 32-022041-3, Assembly Drawing * 32-120007). A load is not required to be connected to the Model GC25E for this adjustment if the **Current Adjust** on the front panel is turned fully counterclockwise.

The adjustable range for Test Time "1" (**R13**) and for Test Time "2" (**R12**) is 0.1 to 18 sec.

1. Select Test Time "1" ("2") by using the **TIME** switch on the front panel.
2. Turn the potentiometer **R13** (**R12**) counterclockwise for increasing the Test time or clockwise for decreasing the Test time.

3. Depress the **Start** switch on the front panel and time the duration of the test. Repeat steps 1 thru 3 as needed.

6-2.3 RESISTANCE TRIP VALUE ADJUSTMENT

The R-Trip "1" and "2" are adjusted by using the potentiometers **R14** and **R15** on the Control P.C.B. (Schematic * 32-022041-1, Assembly Drawing * 32-120007), which is located inside the unit as shown on Fig. 2-3 of Section 2. A typical rejection load must be connected to the Model GC25E.

1. Select R-Trip "1" ("2") by using the **R-Trip** switch on the front panel.
2. Turn the potentiometer **R14** (**R15**) fully clockwise for maximum tripping adjustment.
3. Connect the typical rejection load into the front panel **DUT Test Receptacle**. Connect the alligator clip end of the High Current Output Ground Sense cable to the chassis or any exposed metal part of the DUT.
Turn the front panel **Current Adjust** to the fully counterclockwise position and select a sufficient length of test time with the front panel **Time switch**.
4. Depress the **Start** button. Adjust the front panel **Current Adjust** in the clockwise direction until the desired amount of output current is read on the front panel **AMPS** digital meter. Repeat this step as needed.
5. Depress the **Start** button and slowly turn the potentiometer **R14** (**R15**) in the counterclockwise direction just until the test is aborted with the associated audible alarm and **R-Fail** LED on. Repeat this step as needed.

6-2.4 CIRCUIT CALIBRATION

The following procedure explains how to adjust the Control P.C.B. electronic amplifiers, as well as calibration of the front panel meters.

This procedure should rarely be necessary. However, if it becomes necessary, it should be performed by only well qualified service or metrology personnel. If you are unsure, or have any questions, contact a QUALITEC factory service representative at (415) 498-1046, (415) 498-1047 OR FAX (415) 498-5938. QUALITEC also offers periodic

calibration or adjustment service for a nominal charge.

A voltmeter with a millivolt scale and an adjustable sinewave generator (5V RMS max output) are required for this procedure.

1. Disconnect the cable coming from the High Voltage Board to the Control P.C.B.

2. Connect P1-1 and P1-2 to GND (TP-14) on the Control P.C.B.

3. Set the voltmeter to 10mV DC scale. Connect the voltmeter between ground and TP2, and check that the voltage is at a minimum (zero volts) by turning R6 slightly in each direction. Connect the voltmeter between ground and TP1, and check that the voltage is at a minimum (zero volts) by turning R7 slightly in each direction.

4. Disconnect P1-1 and P1-2 from GND, and connect the external sinewave previously adjusted to 2.5V peak between P1-1 and GND (TP-14) on the Control P.C.B.

5. Set the voltmeter to 10V DC scale. Connect the voltmeter between ground and TP2, and check that the reading in the voltmeter is 2.5VDC by turning R4 slightly in each direction until 2.5VDC is achieved.

6. Disconnect the external 2.5V peak sinewave from P1-1 and connect the external sinewave previously adjusted to 0.07V peak between P1-2 and GND (TP-14) on the Control P.C.B.

7. Connect the voltmeter between ground and TP1 and check that the reading in the voltmeter is 2.5VDC by turning R5 slightly in each direction until 2.5VDC is achieved.

6-3 STORAGE

Store at temperature between 10°C and 60°C.

Humidity less than 95% non condensing

6-4 WARRANTY

QUALITEC warrants to the original purchaser (buyer) that all products are free of defects in material or workmanship, under normal use and

service in accordance with QUALITEC instructions and specifications, for twelve (12) months from date of original shipment. QUALITEC will repair or replace, at its option, the defective parts or products which are returned to QUALITEC freight prepaid by buyer. This warranty is void if the faulty parts or products, in the opinion of QUALITEC, are a result of misuse, neglect, improper installation or servicing, unauthorized modification or accident. QUALITEC makes no other warranty, express or implied. In no event shall QUALITEC be liable for consequential loss or damage, however caused. No person or representative of QUALITEC is authorized to assume for QUALITEC any liability in connection with this equipment nor make any changes to this warranty unless such change is in writing and signed by an officer of QUALITEC. This warranty shall be governed by the laws of the State of California.

Buyer shall promptly notify QUALITEC of any claim against this warranty. Any item to be returned to QUALITEC shall be sent with transportation charges prepaid by Buyer and clearly marked with a Return Material Authorization (RMA) number obtained from QUALITEC.

6-5 RETURNING EQUIPMENT FOR REPAIR

Any equipment returned to QUALITEC must be clearly labeled with a Returned Material Authorization (RMA) number. To obtain an RMA number, contact:

QUALITEC Technologies, Inc.
43064 Christy Street
Fremont, CA 94538

Telephone: (415) 498-1046, (415) 498-1047 or
FAX (415) 498-5938.

Attach a brief description of the problem, Model and serial number of the equipment.

A nominal charge for parts and labor may be assessed on all out-of-warranty products.

SECTION SEVEN

TECHNICAL DOCUMENTATION

PART LIST

GND CONTROL BOARD REV D ASSEMBLY A14

CODE	QUALITEC Part #	DESCRIPTION	VALUE
A14-1	32-020011	P.C.B. Unloaded	Double Sided
A14	32-120007	P.C.B. Loaded	Double Sided
C3, C4, C6, C10-16, C20-27, C32- C34, C37- C39, C41-C45	41-081031 id id id	CAP., Met. Polyes.	.01 μ F 50V 20%
C1, C30	41-010161	CAP., Dip. Tantal.	1 μ F 25V 10%
C2	41-013351	CAP., Dip. Tantal.	3.3 μ F 25V 10%
C31	41-014771	CAP., Dip. Tantal.	470 μ F 6.3V 10%
C28	41-084741	CAP., Met. Polyes.	.47 μ F 50V 20%
C17- C19	41-034761	CAP., Elect. Alum.	47 μ F 25V -10%
C35, C36	41-030191	CAP., Elect. Alum.	1000 μ F 25V -10%
C40	41-033391	CAP., Elect. Alum.	3300 μ F 16V -10%
CR1-5, CR8 -10 CR14-CR16	40-010301 id	DIODE, Switching	1N914
CR18	40-010205	TRANSZORB, Unidir.	5V 500W
CR19, CR20	40-010101	DIODE, Bridge	1A 50V
H1-H3	23-012201	Heat Sink	TO-220 2W
I1, I2, I4-I7, I9	47-011014	IC SOCKET, 14 pins	Solder
I3, I8, I10	47-011016	IC SOCKET, 16 pins	Solder
P1, P3	46-020402	HEADER, 5 pins	Solder
P2	46-020404	HEADER, 2x13 pins	Solder
P4	46-020403	HEADER, 3pin w/lock	Solder
Q1	40-022222	TRANSISTOR, Sw npn	2N2222
RP1, RP2, RP4-RP6	42-551031	RES., 5 Sip 10 pin	10K .1W 5%
RP3	42-544721	RES., 9 Sip Common	4.7K .1W 5%
R4	42-051031	RES., Pot 20 turns	10K .75W
R14, R15	id		
R5, R6, R7	42-052031	RES., Pot 20 turns	20K .75W
R12, 13	42-051041	RES., Pot 20 turns	100K .75W

(Continued)

PART LIST GND CONTROL BOARD REV D ASSEMBLY A14

CODE	QUALITEC Part #	DESCRIPTION	VALUE
R3	42-523031	RES., Film	30K .25W 5%
R9, R23, R35, R36	42-521031	RES., Film	10K .25W 5%
R10, R11, R24	42-521011	RES., Film	100 .25W 5%
R2, R28	42-522031	RES., Film	20K .25W 5%
R20	42-190911	RES., Film	9.09K .25W 1%
R21, R22	42-521051	RES., Film	1M .25W 5%
R26	42-523311	RES., Film	330 .25W 5%
R27	42-521021	RES., Film	1K .25W 5%
R29, R30	42-522221	RES., Film	2.2K .25W 5%
R32	42-522721	RES., Film	2.7K .25W 5%
R37	42-525611	RES., Film	560 .25W 5%
R38	42-110021	RES., Film	10K .25W 1%
R39	42-150011	RES., Film	5K .25W 1%
U1	40-040324	IC, Quad L.P. OpAmp	324
U2	40-040339	IC., Quad Comparator	339
U3, 8	40-038476	IC., Dual JK F-F	74LS76
U4	40-037406	IC., Hex Inv. O.C.	7406
U5	40-037414	IC., Hex Schmitt Tri.	7414
U6	40-040084	IC, Quad JFET OpAmp	84
U7	40-040319	IC., Dual Comparator	319
U9	40-037427	IC., Tri 3-Input NOR	7427
U10	40-040221	IC., Dual Monostable	74HCT22 1E
VR1	40-107915	REG., TO-220	-15V 1.5A
VR2	40-107815	REG., TO-220	+15V 1.5A
VR3	40-107805	REG., TO-220	+5V 1.5A

JUMPER LIST: J5, J7, J9/J10 LEFT, J10/J11 RIGHT, J15-J17,
J20, J23, J24, J26, J28, J28, J31, J35, R1

PART LIST		FRONT PANEL BOARD	ASSEMBLY A24
CODE	QUALITEC Part #	DESCRIPTION	VALUE
A24-1	32-020007	P.C.B. Unloaded	Double Sided
A24	32-120025	P.C.B. Loaded	Double Sided
C1, C2, C3, C11	41-011061	CAP., Dip. Tantal.	10 μ F 25V 10%
C4, C5, C7-C10	41-081031	CAP., Met. Polyes.	0.01 μ F 50V 20%
C6	41-081041	CAP., Met. Polyes.	.1 μ F 25V 10%
CR2	40-010421	DIODE, Yellow L.E.D.	20mA 5Vr
CR3, CR4	40-010401	DIODE, Red L.E.D.	20mA 5Vr
CR5	40-010301	DIODE, Switching	1N914
CR6	40-010303	DIODE, Schottky	1N5818
DS1	30-040101	BUZZER, Piezo Cera.	4mA 3-12V
I1, I2	47-011014	IC SOCKET, 14 pins	Solder
P1	46-020404	HEADER, 2x13 pins	Solder
R1, R5	42-521031	RES., Film	10K .25W 5%
R2	42-521021	RES., Film	1K .25W 5%
R4	42-051031	RES., Pot 20 turns	10K .75W
R6	42-525231	RES., Film	52K .25W 5%
R7	42-524731	RES., Film	47K .25W 5%
RP1	42-541511	RES., 5pin Sip Comm.	150 .2W 5%
RP2	42-541031	RES., 8pin 4 Sip	10K .2W 5%
S1	30-031211	SWITCH, SPDT Slide	4A 115V
S2	30-031212	SWITCH, DPDT Slide	4A 115V
S3, S4	30-031201	SWITCH, SPDT	3A 28VDC
U1	40-034584	IC., Hex Schmitt Trig.	4584
U2	40-044066	IC., Quad Anal. Switch	CD4066
U3	40-060100	IC., Precision Divider	DIV100
U5	40-040324	IC., Quad L.P. OpAmp	324

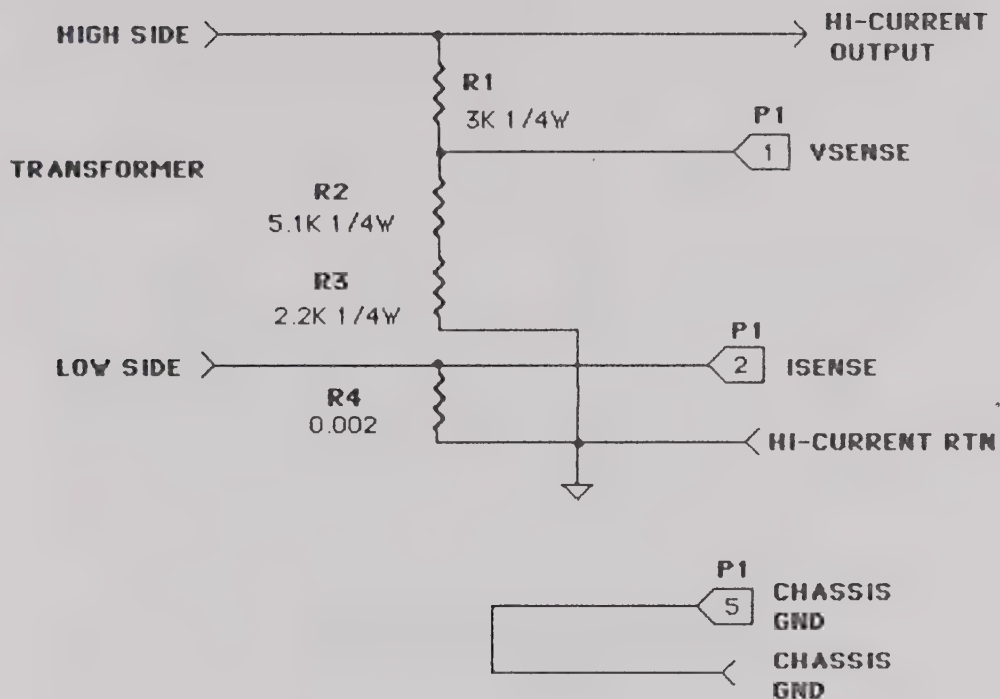
JUMPER LIST: J4, J6, AMMETER 3,4; U4-1,2; U4-3,4; U4-8,9; U4-10,11

PART LIST
BOARDHIGH CURRENT
ASSEMBLY A90

CODE	QUALITEC Part #	DESCRIPTION	VALUE
A90-1	32-020009	P.C.B. Unloaded	Double Sided
A90	32-120090	P.C.B. Loaded	Double Sided
R1	42-513021	RES., Carbon	3K .25W 5%
R2	42-515121	RES., Carbon	5.1K .25W 5%
R3	42-512221	RES., Carbon	2.2K .25W 5%
R4	42-510122	RES., Carbon	5x0.01 3W 5%
P1	46-020402	HEADER, 1x5 pins	Solder

PART LIST ELECTRICAL PARTS PANELS, CHASSIS ASSEMBLIES

CODE	QUALITEC Part #	DESCRIPTION	VALUE
A14	32-120007	Board	Control
A24	32-120025	Board	Front Panel
A25	47-030101-5	HV Receptacle	40A
A90	32-120090	Board	HI
A60	32-120061	Board	Solid State Relay
GC25E	01-039030	Manual	GC25E
J1	47-030102	Receptacle	Line Filter
M1, M2	30-050101	Digital Meters	3 1/2 digits
S1	30-031131	SPST Switch	10A Amber light
T1	33-022002	P. S. Transformer	8, 30CT, 22, 1.5V
T2	33-023005	HI Transformer	10V 40A
T3	33-021001	Variac	120V



April 1987

Check Ramon

Design Ramon

QUALITEC

HIGH CURRENT BOARD

Code **AD0** Dwg. # **32-022009**

SECTION EIGHT

OPTIONS INSTRUCTIONS

8 OPTIONS INSTRUCTIONS

8-1 INTRODUCTION

This section describes the functional capability, installation instructions, and operating instructions, as appropriate, for each of the available options for the QUALITEC tester(s) covered by this manual. Your particular tester may not have any of these options installed but if they are, the related instructions in this section apply. Some option instructions are more detailed and extensive depending on their functional characteristics and use, while others may be brief and refer to other sections of the Operation and Service Manual for further instructions. If you have additional questions not answered in this section, contact a QUALITEC factory representative at (510) 498-1046, (510) 498-1047 or FAX (510) 498-5938.

OPTION Q30-3**TTL REMOTE CONTROL/ANALOG MONITORING**

This option consists of a P.C.B. assembly which allows remote control operation and test results monitoring of QUALITEC Hipot Testers and Ground Continuity Testers via TTL logic for interfacing with industry standard controllers. Also, High Voltage and Leakage Current or High Current and Ground Continuity Resistance Outputs can be monitored via proportional analog voltages.

The following paragraphs and schematic drawing #32-022038 describe the operational characteristics as well as the signal and interface connector DB-25 pin assignments.

INPUT SIGNALS:

The remote input signals required to control the tester are START and RESET. The signal/pin assignments for the DB-25 connector P1 are:

<u>INPUT SIGNAL</u>	<u>DB-25 PIN *</u>
START	1, 14(GND)
RESET	15, 3(GND)

In order to initiate a remote START, the user must provide a low level voltage (NOTE: User's contacts must be rated for a minimum of 2 milliamps capability), between pins 1 and 14 of the DB-25 connector on the rear panel of the tester. The START function is activated by an high-to-low transition across pins 1 and 14. The duration of the low level may be any duration of at least 10 milliseconds or greater. Once the START signal is activated, additional START signals are locked out until the current test cycle is completed or aborted and the signal across pins 1 and 14 goes high for at least 10 milliseconds. A RESET signal must precede a START signal if the READY signal is not present at the output. The presence of the READY signal is required in order to initiate a START. Refer to SECTION 2 for a further description of the START function.

In order to initiate a remote RESET, the user must provide a low level voltage for at least 10 milliseconds with a minimum of 2 milliamps capability, between pins 15 and 3 of the DB-25 connector on the rear panel

of the tester. The RESET function is activated as long as the low level exists and inhibits START signals until pin 15 goes high again. Refer to SECTION 2 of the tester manual for a further description of the RESET function.

OUTPUT STATUS AND MONITOR SIGNALS:

The remote output signals available to monitor test status and results are READY TO TEST (RDY), TEST-IN-PROGRESS (TEST), ARC FAILURE (ARC), EXCESSIVE CURRENT FAILURE (I-FAIL or R-FAIL), FAILURE (FAIL) and the analog outputs VOLTAGE, CURRENT and RESISTANCE when applicable.

The signal/pin assignments for the DB-25 connector P1 are:

<u>OUTPUT SIGNAL</u>	<u>DB-25 PIN#</u>
<u>STATUS OUTPUTS</u>	
READY (RDY)	4
TEST	6
I-FAIL or (R-FAIL)	9
ARC	10
FAIL	7
<u>MONITOR OUTPUTS</u>	
VOLTAGE	11
CURRENT	12
RESISTANCE	25
AGROUND	13

Each Status output signal is a "normally high" set of TTL signals. Each Status output signal is activated when the tester electronics drives low each pin output.

The FAIL (pin 7) signal, which is synonymous with the audible alarm, will also exist simultaneously whenever either the READY (RDY) signal becomes inactive or the I-FAIL (or R-FAIL) and/or ARC failure signals become active during a test cycle. Refer to SECTION 2 of the tester manual for a further description of the READY, TEST, I-FAIL (or R-FAIL), and ARC functions.

Each Monitor output signal VOLTAGE (pin 11), CURRENT (pin 12) and RESISTANCE (pin 25) when applicable, is an analog voltage proportional to the actual High Voltage Output, Leakage Current Output and Insulation Resistance Output, or High Current Output and Ground Resistance Output

respectively. Each signal is referenced to the analog ground AGROUND (pin 13).

VOLTAGE monitor output provides 1 volt per every 1000 volts of high voltage output for QUALITEC Hipot testers with high voltage output capability exceeding 1000 volts. Otherwise, the VOLTAGE monitor output provides 1 volt per every 100 volts.

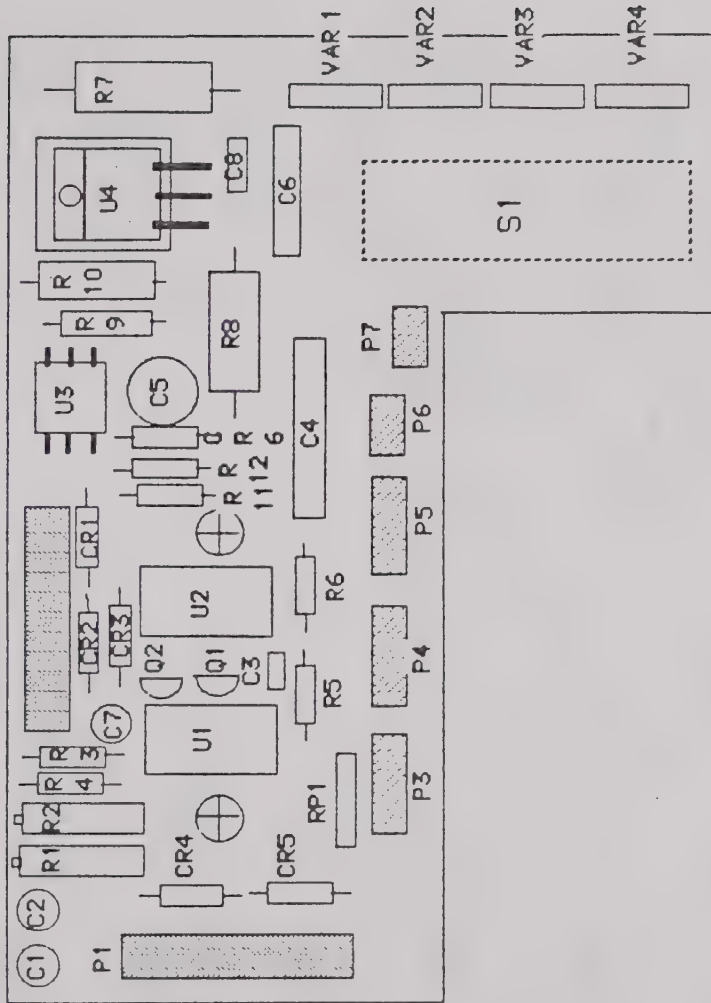
CURRENT monitor output provides 1 volt per every 1mA of leakage current for QUALITEC Hipot testers with leakage current output capability exceeding 1mA. Otherwise, the CURRENT monitor output provides 1 volt per every 100 microamps.

RESISTANCE monitor output provides 1 volt per every 100 Megohms of insulation resistance for QUALITEC Megohmmeters or 1 volt per every 0.1 ohms of ground continuity resistance for QUALITEC Ground Continuity Testers.

As shown in the Drawing #32-022038, the TTL/ANALOG MONITORING interfaces with the CONTROL BOARD thru the connector P2, and with the DB-25 thru the connector P1.

The Driver U1 takes the monitoring signals from the CONTROL BOARD and drives the corresponding Outputs. CR1 thru CR3 insures voltage level interface for U1. U2 filters analog outputs. U3 and U4 are used only for high voltage control and are unrelated to the remote control functions.

PART LIST		TTL BOARD	ASSEMBLY A85
CODE	QUALITEC Part #	DESCRIPTION	VALUE
A85-1	32-020008	P.C.B. Unloaded	Double Sided
A85-2	32-120085	P.C.B. Loaded	Double Sided
C1	41-011061	CAP., Dip. Tantal.	10 μ F 25V 10%
CR6 - CR8	40-010304	DIODE, Schottky	1N5818
R1 - R5	42-521031	RES., Film	10K .25W 5%
P1, P2	46-020404	HEADER, 2x13 pins	Solder
U1	40-037407	IC, Hex Driver O.C.	7407



QUALITEC

Q30-3 TTL /SS RELAY

DRAWING # 32-022038A

SCALE

DATES

2/2/91

APPROVALS

Drawn BILL M

Checked

Engr BILL M

Rel

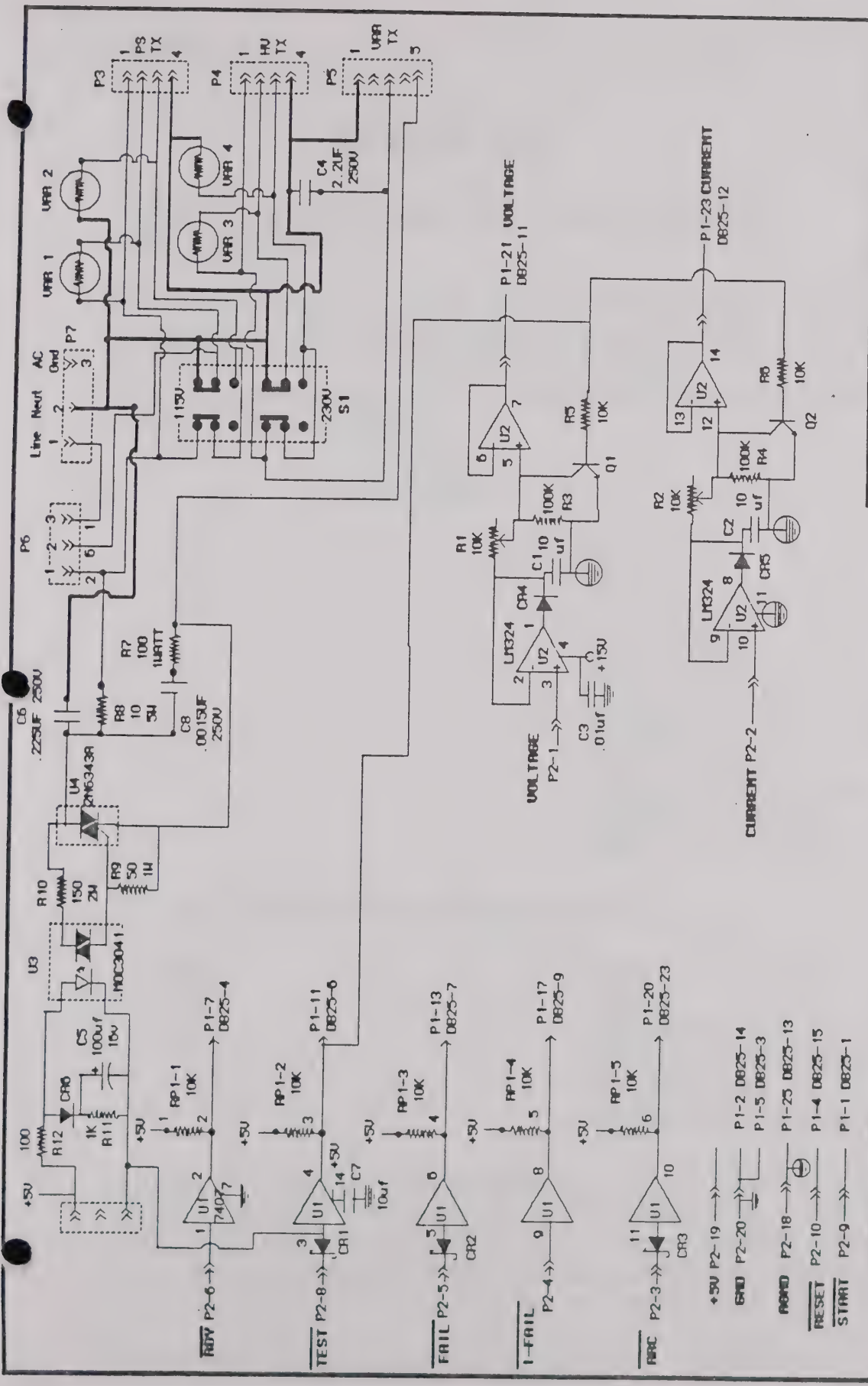
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DO NOT SCALE DRAWING

2/6/91

SHEET 1 OF 1

REV



QUALITEC			
TTLREM/938RLY			
APPROVALS	DATES	SCALE	DO NOT SCALE DRAWING
Drawn BLM	2/2/91	SIZE	SHEET 1 OF 1
Checked	2/4/91	SCALE	REV
Engr BLM		SCALE	
Rel	2/6/91	SCALE	
Material: Finish: Dimensions: Tolerances unless otherwise specified Fractions Dec Angles			
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DRAWING # 32-022038

OPTION Q40

DRY CONTACT RELAY COMPATIBLE REMOTE CONTROL /ANALOG MONITORING

This option consists of a P.C.B. assembly with an interface connector assembly. It allows remote control operation and test results monitoring of all QUALITEC Testers via dry contact relay switches for interfacing with industry standard controllers. The tester input/output functions which it controls and monitors include:

HIPOT TESTERS

INPUT

START

RESET

OUTPUT

READY

TEST-IN-PROGRESS

ARC FAILURE

EXCESS CURRENT (OR LOW
RESISTANCE) FAILURE

GROUND CONTINUITY FAILURE

VOLTAGE VALUE

CURRENT VALUE (AND/OR
RESISTANCE VALUE)

SAFETY GROUND SENSE

HIGH CURRENT GROUND CONTINUITY TESTERS

INPUT

START

RESET

OUTPUT

READY

TEST-IN-PROGRESS

GROUND CONTINUITY FAILURE

CURRENT VALUE

GROUND RESISTANCE VALUE

This option is factory or user installable into all QUALITEC Testers. Installation consists of mounting the P.C.B. assembly inside of the tester cabinet with two screws, mounting the connector assembly with two screws into an existing port in the rear panel, and connecting two ribbon cables between the H.V. Control P.C.B. and the Remote Control P.C.B.

OPTION Q50H

EXTENSION CORD START/RESET HAND CONTROL

This option consists of a P.C.B. assembly, an interface connector assembly, and a hand-held switch assembly with a start button, a reset button and a 10 foot cord assembly. It allows control of the START and RESET functions of all QUALITEC Testers from a distance of 10 feet from the test station.

This option is factory or user installable into all QUALITEC Testers. Installation consists of mounting the P.C.B. assembly with two screws, attaching an inteconnect cable assembly between the P.C.B. and the rear panel connector inside the tester cabinet, and mounting the connector assembly with two screws into an existing port in the rear panel. Then connect the cord assembly of the hand-held switch assembly into the mating connector which was installed into the rear panel.

OPTION Q50H - EXTENSION CORD START/RESET HAND CONTROLS

The following procedure describes the operation of the Extension Cord Start/Reset Hand Control (Option Q50H).

Plug the connector end of the hand control cable into the remote interface connector (Item# 3 on the rear panel of the tester shown in Figure 2-2 of the Operation and Service Manual).

WARNING: The hand switch is operational whenever the power switch on the front panel of the tester is in the ON (I) position.

The front panel START and RESET buttons are also operational when the Extension Cord Start/Reset Hand Control (Option Q50H) is connected to the tester.

The hand control switch operates in the same manner as the START and RESET switches on the front panel. When the TIME switch on the tester front panel is in position "1", depressing the hand switch will initiate an automatic timed test cycle (factory setting is 1 second). After depressing the hand switch, the output high voltage will ramp up and remain at the preset amplitude until the end of the cycle time unless a failure condition is detected in the device under test. The RESET button will abort a test cycle or reset all failure alarms.

When the TIME switch on the tester front panel is in position "2", depressing the hand switch will initiate an automatic timed test cycle (factory set at 60 seconds).

Now follow the operation procedures listed in Section 3 of the tester manual and substitute the hand switch wherever reference is made to the front panel START button and RESET button.

OPTION Q50F

EXTENSION CORD START/RESET FOOT CONTROL

This option consists of a P.C.B. assembly, an interface connector assembly, and a foot switch assembly with a 10 foot cord assembly. It allows control of the START and RESET functions of all QUALITEC Testers from a distance of 10 feet from the test station.

This option is factory or user installable into all QUALITEC Testers. Installation consists of mounting the P.C.B. assembly with two screws, attaching an inteconnect cable assembly between the P.C.B. and the rear panel connector inside the tester cabinet, and mounting the connector assembly with two screws into an existing port in the rear panel. Then connect the cord assembly of the foot switch assembly into the mating connector which was installed into the rear panel.

OPTION Q50F - EXTENSION CORD START/RESET FOOT CONTROLS

The following procedure describes the operation of the Extension Cord Start/Reset Foot Control (Option Q50F).

Plug the connector end of the foot control cable into the remote interface connector (Item# 3 on the rear panel of the tester shown in Figure 2-2 of the Operation and Service).

WARNING: The foot switch is operational whenever the power switch on the front panel of the tester is in the ON (I) position.

The front panel START and RESET buttons are also operational when the Extension Cord Start/Reset Foot Control (Option Q50F) is connected to the tester.

The foot control switch operates in the same manner as the START switch on the front panel. When the TIME switch on the tester front panel is in position "1", depressing the foot switch will initiate an automatic timed test cycle (factory setting is 60 seconds). After depressing the foot switch, the output high voltage will ramp up and remain at the preset amplitude until the end of the cycle time unless a failure condition is detected in the device under test.

When the TIME switch on the tester front panel is in position "2", high voltage will be generated at the HIGH VOLTAGE OUTPUT RECEPTACLE as long as the foot switch is continuously depressed unless a failure condition is detected in the device under test. If the foot switch is released while the TIME switch is in position "2", the high voltage output generation will cease.

Now follow the operation procedures listed in Section 3 of the tester manual and substitute the foot switch wherever reference is made to the front panel START button.

OPTION Q120

EXTENDED WARRANTY/SERVICE POLICY

This option extends the warranty and service policy on a QUALITEC tester for an additional year beyond the initial warranty period. This option provides, at no additional charge, inspection and recalibration twice during this extended warranty period and all* material and labor for electrical repairs except those which, in the opinion of QUALITEC, are a result of misuse, neglect, improper installation or servicing, unauthorized modification or accident.

* Material costs of transformers, variacs, digital panel meters, and H.V. Output Receptacles are not included in this policy; however, labor to replace these items is provided at no charge.

This option must be purchased before the initial warranty period expires or before an existing extended warranty/service policy expires. For testers whose initial warranty period or extended warranty/service period has expired, QUALITEC requires a factory inspection and necessary repairs made, at the expense of the owner, before an extended warranty policy is granted.

Owner of the tester must return any tester for repair to the QUALITEC factory with freight prepaid by the owner. QUALITEC may require up to one week for repairs (longer only if replacement parts are not readily available). QUALITEC will pay for return freight to customer via United Parcel Service (U.P.S.) Ground Freight or equivalent. Additional expense for other methods of return freight requested by the owner must be paid by owner.

OPTION Q130

19 INCH RACK MOUNT KIT

This option consists of two E.I.A. RETMA rack mount brackets and mounting hardware. It allows the 17 1/2 inch QUALITEC testers to be conveniently mounted into a 19 inch cabinet or rack. This rack mount kit is also installable on the narrower 8 1/4 inch QUALITEC testers, but the user would need to adapt the unit to a 19 inch cabinet by an additional method such as a spacer bracket not supplied by QUALITEC.

This option is factory or user installable.

OPTION Q160

REAR PANEL SYSTEM INTERCONNECTS

This option consists of a PCB Assembly, a High Voltage System Interconnect Cable Assembly and Rear Panel Connectors. This option allows a QUALITEC Hipot Tester to operate as a system with a QUALITEC 10, 25 to 30 Amp Ground Continuity Tester as if both instruments were in one cabinet/enclosure. Each tester in this system configuration can also be operated as separate instruments while interconnected.

This option is factory installable into all full size QUALITEC Testers.

OPTION Q160 - REAR PANEL SYSTEM INTERCONNECTS

User set-up of this system interconnect operation consists of plugging the three conductor High Voltage System Interconnect Cable Assembly into the matching receptacle on the rear panel of each tester.

To operate the Hipot Tester and the 10, 25 to 30 Amp Ground Continuity Tester as a system, plug the device-under-test (DUT) into the three prong output receptacle on the front panel of the 10, 25 to 30 Amp Ground Continuity Tester. Connect the black Safety Ground Sense Cable from the Ground Continuity Tester front panel SGS Receptacle to the DUT chassis ground point. Connect the red High Current Cable from the Ground Continuity Tester front panel Current Output Receptacle to the DUT chassis ground point.

To perform a 10, 25 to 30 Amp Ground Continuity test, press the red reset button on the front panel of the Ground Continuity Tester followed by pressing the white start button (If remote controls are used, activate the remote reset and start signals as instructed in Options Instructions for Remote Controls Q30 or Q40 in Section 8 as appropriate). At the conclusion of a satisfactory test (TEST LED extinguishes with no failure indicator), press the reset button on the front panel of the Hipot Tester followed by the start button to perform a Hipot Test (If remote controls are used, activate the remote reset and start signals as instructed in Option Instructions for Remote Controls Q30 or Q40 in Section 8 as appropriate). There is NO NEED to replug the DUT into the Hipot Tester to perform a Hipot Test. The rear panel High Voltage Interconnect Cable Assembly transfers high voltage from the Hipot Tester to the 10, 25 to 30 Amp Ground Continuity Tester. (**WARNING:** High voltage is present at the 3 prong output receptacle on both testers during a Hipot Test).

To perform tests as separate instruments, follow operator instructions for each tester in their manuals (Section 3).

ACCOPRESS®

25970	YELLOW
25971	BLACK
25972	LIGHT BLUE
25973	DARK BLUE
25974	LIGHT GRAY
25975	LIGHT GREEN
25976	DARK GREEN
25977	TANGERINE
25978	RED
25979	EXECUTIVE RED

GENUINE PRESSBOARD



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